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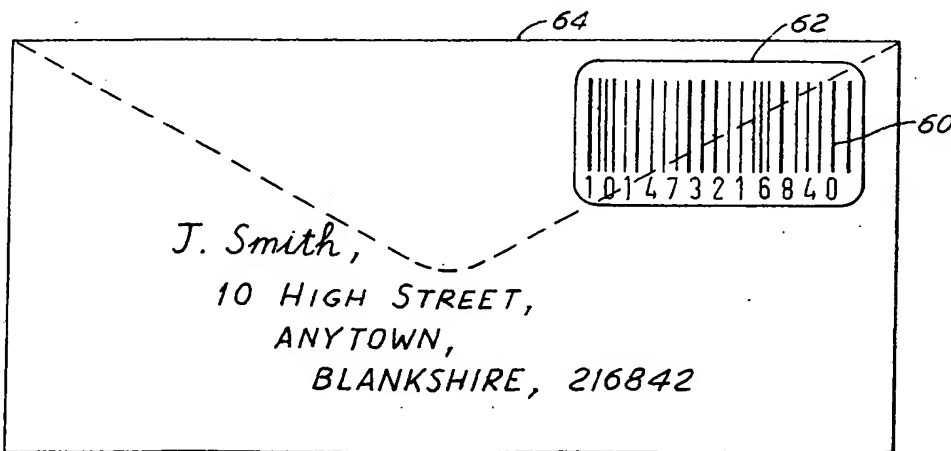
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(54) A franking machine for
domestic and office use and system
for using same

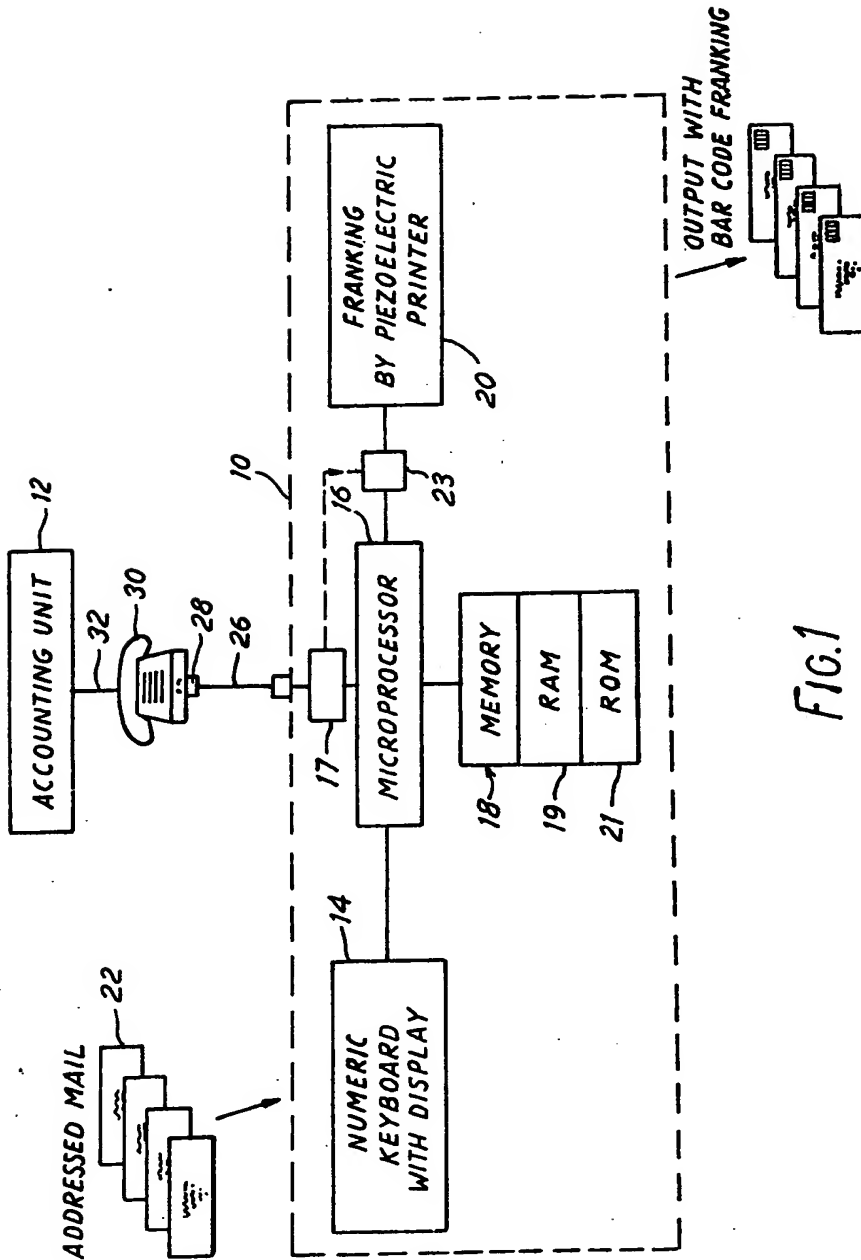
(57) A system and machine for
applying a bar code to a package to be
delivered is disclosed. The bar code
60 embodies franking value
information as well as destination
information, and, in the same
operation debits the relevant account
at a remote location with a monetary
amount corresponding to the franking
value. Reading the bar code can be
used to sort the mail.

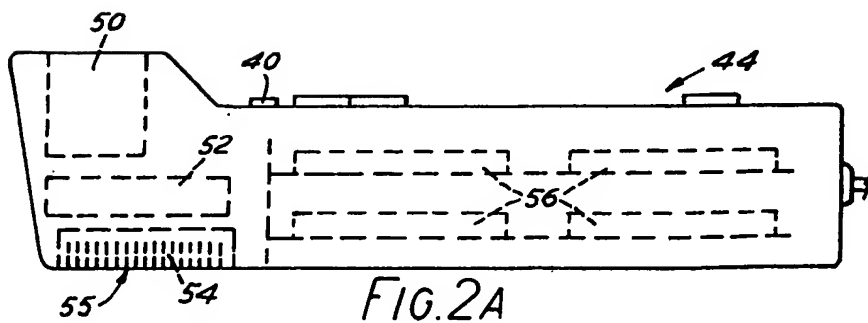
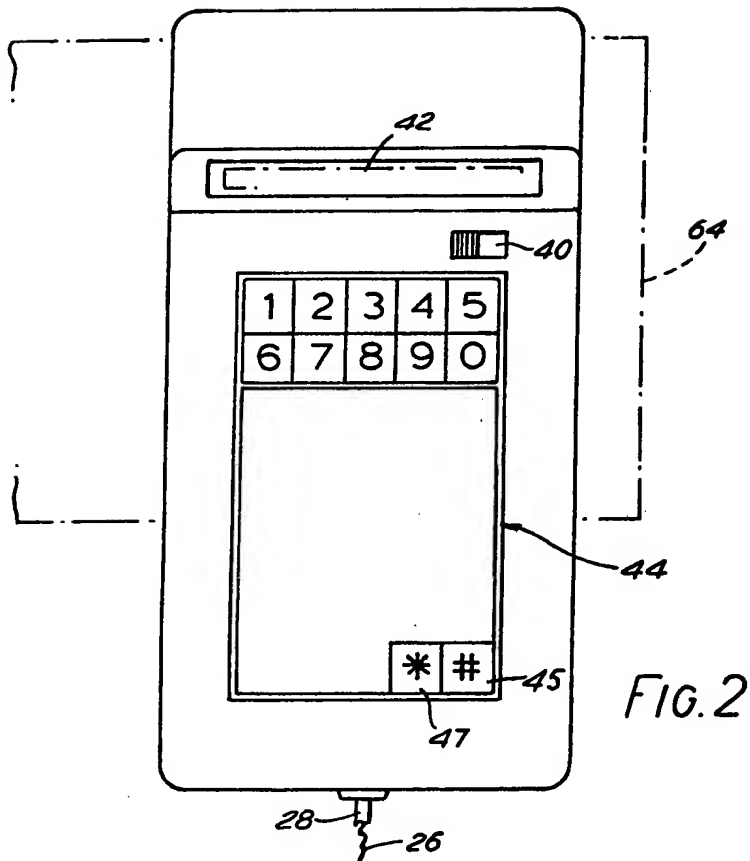
FIG.3

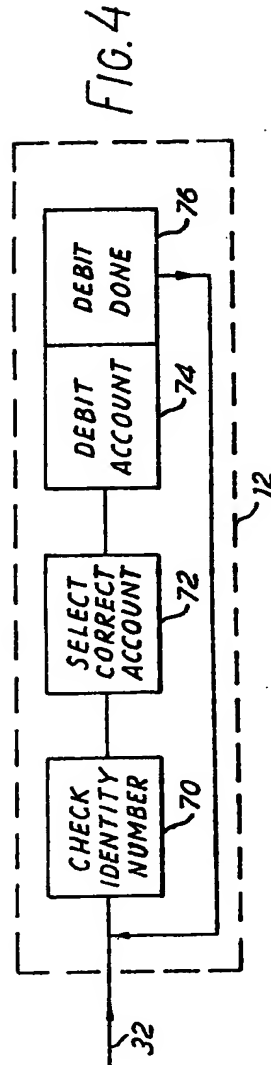
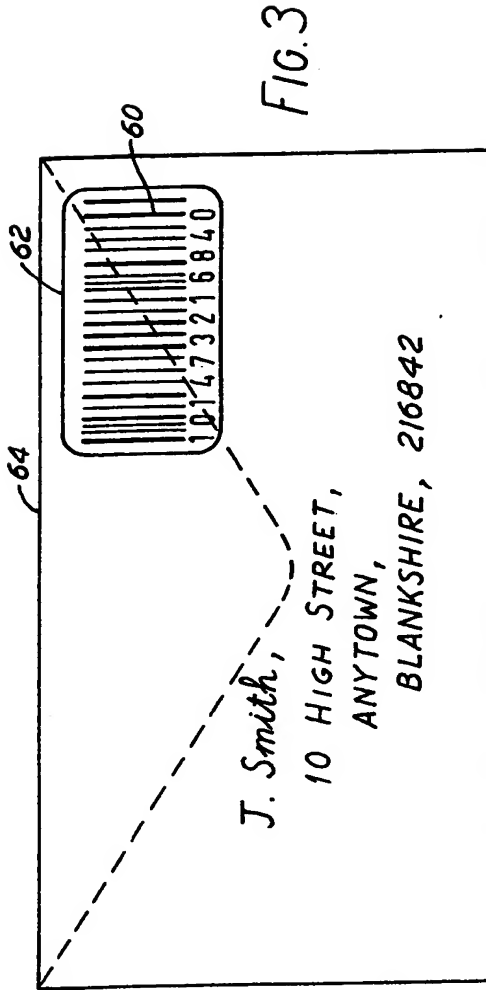


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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.







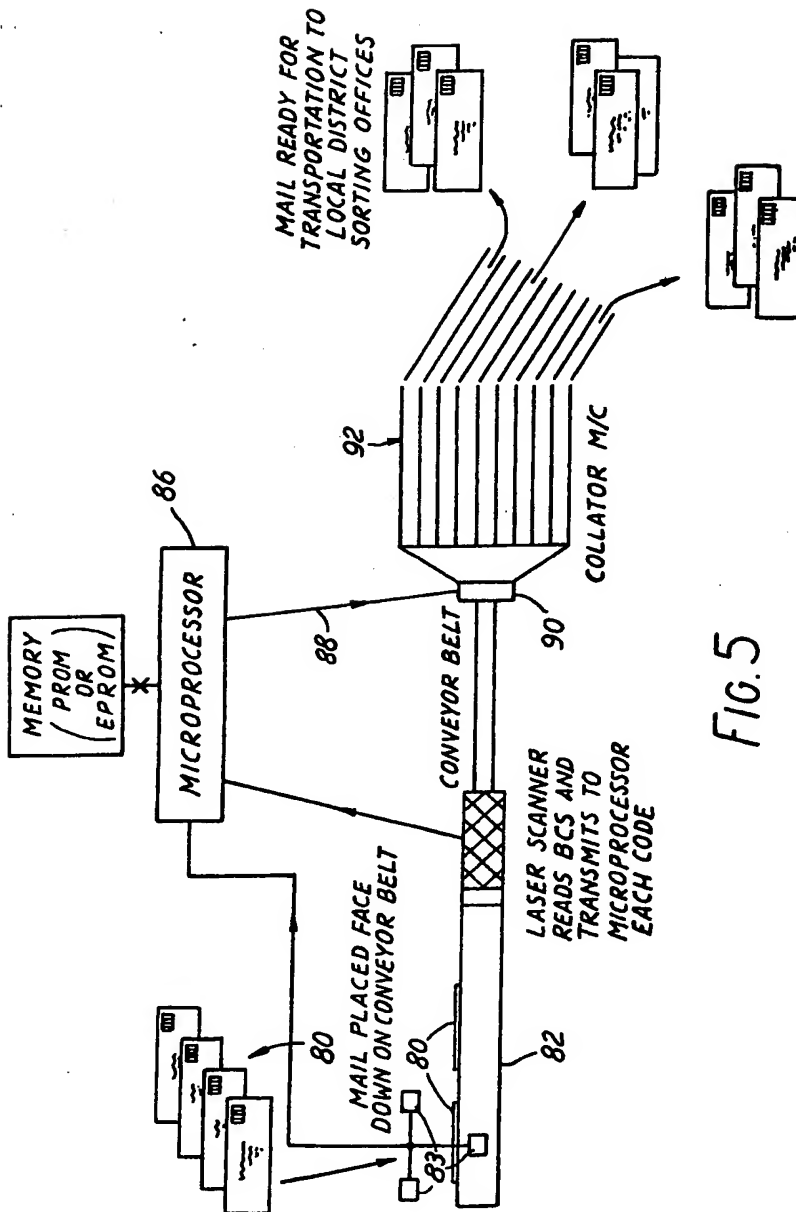


FIG. 5

SPECIFICATION

A franking machine for domestic and office use and system for using same

This invention relates to a portable franking machine and system for its use.

The broad idea of applying to an envelope a marking or code indicative of both the franking value and the intended destination is known, having been proposed for example in British Patent Specification No. 1 383 518 (partly equivalent to U.S. Patent Specification No. 4 024 380 D. M. GUNN) and in U.S. Patent Specification No. 4 117 975 of D. M. GUNN. In U.S. Patent Specifications Nos. 3 757 942 and 3 983 366 GUNN proposes designs of sorting machine which are particularly adapted for recognising and reading particular type of code marking which he employs, and then sorting the envelopes which carry them. This code is essentially a particular arrangement of dots which may be magnetic, electrostatic, fluorescent or electrically conductive. It has also been proposed to use character recognition equipment to "read" an arrangement of lines on an envelope or other document: in British Patent Specification No. 1 487 114 a system for reading documents "on the fly" is disclosed.

In none of these prior proposals, ingenious though they are, is there any teaching for allowing a user in his own home or office to apply visible indicia to a package, which indicia embodies both the franked value and destination information usable in sorting, the user's account at a remote location being thereupon debited with a monetary amount corresponding to the franking value.

A portable hand-held franking machine has been proposed in U.K. Patent Specification 1 566 341 and in U.S. Patent Specification No. 4 168 533 but these do not propose any means whereby a bar code may be applied to an envelope or package nor do they suggest that the single application of a bar code to an article to be delivered can be effective both to enable a user's account to be debited and to facilitate automatic sorting of the article in the course of its delivery to its destination.

According to the invention in its broadest aspect there is disclosed a system of applying a bar code to a package or the like to be delivered, the bar code embodying franking value information as well as destination information, and by the same procedure, debiting a relevant account at a remote location with a monetary amount corresponding to the franking value.

According to the invention, there is provided a portable franking machine particularly for domestic use, the machine including a keyboard of push buttons or the equivalent whereby numerical data can be fed into the machine; electronic circuitry, e.g. a microprocessor, connected to the keyboard the microprocessor being associated with a memory having a first storage portion containing an address code unique to the machine, a second storage portion containing

information necessary to enable the bar code equivalent of a series of numerical digits, to be printed by a printer in the machine, and a third storage portion containing postal rate and postal class data to enable the calculation by the microprocessor of postal charges from an address code assigned to the intended destination and the unique address code of the machine; and a printer whereby a series of visible indicia indicative of a particular combination of numerical characters can be printed in the form of a bar code on an envelope, package, parcel or like article, the particular combination being selected by the user by operation of the keyboard.

In a preferred embodiment of the invention, the visible indicia are the elements of a bar code. Bar codes as such are known, and have been used for some years in retailing for optical-electronic identification of purchases in supermarkets, adjustment of records of inventories, and re-ordering of stock.

In a specially preferred embodiment of the invention, the franking machine is attached to an electrical cable which can be plugged in or otherwise attached to a telephone line, and a section of its circuitry is connected via the cable and the line to a central accounting unit. The function of this section is to transmit an electrical signal embodying numerical information to a central accounting unit remotely located at the end of the telephone line. In this way, the user's account, e.g. his telephone account, is directly debited with the cost of sending the article.

As the visible indicia applied to the article contain the information necessary to identify the article's intended destination, automatic indicia-recognition and interpretation equipment, in particular, a known bar code reader, may be used in an automated sorting machine at a sorting office. In such a machine, articles bearing the indicia, i.e. the selected applied bar code, would be passed through the bar code reader, and logic circuitry connected to or embodied in the reader would operate a series of diverting gates so that the article is directed to a storage location corresponding to the destination code applied thereto.

Accordingly the invention also provides a sorting machine for sorting articles such as letters and small packets bearing visible indicia in the form of a bar code thereon, the machine including as essential elements a sensing head for reading the bar code, a plurality of gates for diverting articles from one flow path into another, and a microprocessor for actuating the gates in accordance with signals from the sensing head resulting from the particular indicia on the article.

The invention further provides an accounting unit connectable to a telephone line and constructed and arranged to receive a signal embodying numerical information representative of the identity of the transmitting franking machine and of a monetary franking value, and to utilise the latter part of the signal to debit an accounting descending register with an amount

corresponding to the said monetary value.

In a preferred embodiment of the invention the printer in the franking machine may be an ink jet printer. The ink jet printer may embody actuation by an electrical-to-mechanical transducer formed by a piezoelectric ceramic member whose fluctuations under an applied signal cause ejection of an ink drop from a capillary tube. Such devices are known *per se*, and the reader is referred to page 4, column 2 of U.K. Patent Specification No. 1 566 341 for a more detailed description.

In this disclosure, reference is made to the use of a telephone line to carry a value signal from the domestic franking machine to a remote accounting unit. The present invention is of course not limited to the use of a telephone line; any data-carrying network could be used with appropriate modifications. It is anticipated that use of pre-existing telephone lines will be preferred, since equipment already exists for debiting user's calls to an accounting register and this equipment would be readily adaptable to the purposes of this invention.

This invention also provides a system for the franking and despatching of articles such as letters or packages, the system comprising a franking machine for applying to the article visible indicia containing information relating to (a) the franking value applied, (b) the intended destination; an accounting unit located remotely from the franking machine and having a register which contains a record of a monetary balance amount, the accounting unit being connected to, or connectable to, the franking machine by an electric cable; and a sorting machine for handling articles bearing said visible indicia, for scanning same, and for redirecting them into flow paths chosen in accordance with the intended destination information.

The invention will be better understood from the following non-limiting description of an example thereof given with reference to the accompanying drawings in which:—

Figure 1 is a diagram illustrating a system in accordance with the invention and in particular illustrating the functions of a franking machine according to the invention;

Figure 2 illustrates one form of franking machine according to the invention;

Figure 3 illustrates an envelope bearing one kind of visible indicia (a bar code) which may be used in a system according to this invention;

Figure 4 is a block diagram of an accounting unit for use in a system according to the invention; and

Figure 5 is a block diagram of a sorting machine for use in a system according to the invention.

Figure 1 illustrates a franking machine 10 connected to an accounting unit 12. The essential components of the franking machine are a numeric keyboard with display 14, a microprocessor 16, an electronic lock 17, a memory 18 forming part of or connected to the microprocessor, and a printer unit 20 which is operable by means of signals provided by the

microprocessor. The printer unit 20 is constructed and arranged to apply a visible indicia, in particular a bar code, to an envelope 22, and the bar code is designed to carry firstly information relating to the nature of the article (e.g. size or weight), secondly information relating to the class of postage or delivery service required, and thirdly information relating to its destination. Franked envelopes are seen at 24. As illustrated in Figure 1, the franking machine has a cable 26 extending therefrom which terminates in a plug 28; the plug is constructed and arranged to be plugged in to a modified telephone 30 in order to connect the franking machine 10 with an accounting unit 12, particular to the telephone number concerned, remotely located from the user, for example at the telephone exchange. Usually in practice the connection between the accounting unit 12 and the telephone 30 will be by way of a conventional telephone line 32.

The memory 18 includes two sections, namely a random-access memory (RAM) 19 and a read-only memory (ROM) 21. The functions of these will be explained in the following description.

A conventional bar code consists of a number of back lines of different thicknesses on a white ground, and normally enables twelve decimal digits to be represented within a bar code length of about 30 mms. According to the system and franking machine particularly disclosed herein, the twelve digits have the following functions.

The last nine digits are used to represent the intended destination for the article. For this purpose, the country or territory to be covered by the automatic sorting system is divided up as follows:—

major sorting areas each having one major sorting office

regional sorting areas all within the major sorting area and each having a regional sorting office

sub-regional sorting areas all within the regional sorting area and each having a sub-regional sorting office

local sorting offices all within a sub-regional area and each having a local sorting office
an individual postal "walk", that is to say, daily journey of a postman, such a postman being based at the local sorting office.

The fourth to the twelfth digits are those which carry destination information. The fourth and fifth digits are used to identify the major sorting office, it being therefore possible to divide the country or territory into up to 100 major sorting areas. The sixth and seventh digits represent the number of the regional sorting office, it being therefore possible to have up to 100 regional sorting areas within a major sorting area. The eighth and ninth digits represent the sub-regional sorting office, it being likewise possible to have up to 100 sub-regional sorting areas subordinate to a regional sorting area. The tenth and eleventh digits represent the number of a local sorting office, it being therefore possible to have up to 100 local sorting offices within a sub-regional sorting area.

The twelfth digit represents a particular postman, it being possible to have up to nine postmen working from a local sorting office.

- Of course variations in this scheme of arrangement may be employed, depending on geographical conditions, availability of postmen, and other factors.

- The first digit is used to identify the category of mail item to be delivered. All possible mail items for which the disclosed system is intended to be used are divided into up to ten categories, numbered zero to nine, and these categories are specified in published information to be issued by the operating service to its users and customers.
- For example, one could have different categories for post cards, letters up to 9 inches by 4 inches, envelopes weighing under 35 grams, and different categories for different maximum weights of parcels.

- The second digit of the twelve is used to indicate and identify the class of post by which the mailed item is to be transported. In the alternative, in a private i.e. non-Governmental, delivery system, this digit would be used to indicate the manner and/or class of delivery which is to be employed. In the former case, for example, the second digit would indicate whether the first or second class post is involved, whether airmail is used, etcetera. In the latter case, this digit would indicate whether delivery by motor cycle messenger, helicopter, standard van service, or other manner of delivery would be employed. It will be seen that this system offers the facility of many different kinds of postal service, tailored to the requirements of the users.

The third digit of the twelve is a spare digit which is, according to present thinking, not used.

- The manner of operation of a hand-held franking machine according to the invention will be better understood from the following description. Firstly, the user inserts the plug 28 into a suitably modified domestic telephone 30 which connects the hand-held franking machine and calculator with the accounting unit 12. The user then switches on the machine with the on-off switch 40, and feeds in the first digit which is selected according to the nature, e.g. weight or size, of the article which is to be posted or delivered. The digits appropriate to different categories of article are assigned in literature published by the Post Office or the delivery service and it is merely a question of the user looking up the appropriate leaflet to find out the correct digit for the article he has in hand.
- Next, the user feeds in the second digit by pressing an appropriate one of the keyboard numerals, and here the selected digit is chosen to correspond to the desired class or category of postage or delivery service needed, that is, the second digit is selected in accordance with the manner of delivery desired. Once again, the various possible categories are defined in literature issued by the Post Office or the delivery service as the case may be. The user then presses the zero button for the third digit and, thereafter,
- looks up the published tables giving the major

sorting office number, the regional sorting office number, the sub-regional sorting office number, the local sorting office number and the postman number appropriate to the addressee of the package or article. These nine digits are fed in and the hand-held calculator-franking machine displays what has been fed in at the display 42. There is then an opportunity for the user to check that he has correctly fed in the digits he wished.

- Each hand-held calculator-franking machine has its own unique nine digit address code. At this time, the user has fed in the nine digit address code of the intended destination and the microprocessor 16 is programmed to calculate from the unique address code of the machine in question and the destination code a franking value equal to the cost of postage or the delivery of the article from the location identified by the unique address code of the machine to the location identified by the destination code which has been punched in. For this purpose, for example, the programme in the microprocessor may provide that the two digit code identifying the major sorting office is subtracted from the two digit code identifying the address of the machine, and a mathematical multiplier factor used to multiply the answer. Likewise, a comparison is made between the two digit regional code of the machine and the two digit regional code of the address and a different multiplier factor is used to multiply the answer. In a similar way, multiplier factors are used to multiply the answers derived from a comparison of the two digit sub-regional address codes and the two digit local address codes. The results of these multiplication operations are summed and the answer is a franking value, namely the cost of despatching the article to its destination. As soon as this franking value is calculated by the microprocessor 16, it is fed directly along the lines 26 and 32 to the accounting unit 12, preceded by the unique digital combination which is the address code of the particular franking machine concerned. This address code ensures that the franking value immediately following is debited to the account corresponding in number to the unique address of the machine concerned, in the accounting unit 12.
- As soon as this debiting of a balance held in the accounting unit 12 has been accomplished, the accounting unit 12 sends an "electronic lock release" signal back along the line 32, 26 to the electronic lock 17. As soon as the signal is received in the electronic lock 17, a gate 23 is opened so allowing a franking value signal calculated by the microprocessor 16 to be fed to the printer 20. As a result, the printer 20 is actuated to print a bar code corresponding to the twelve digits fed into the keyboard of the franking machine.
- In the RAM 19 are held data enabling the bar code printer 20 to print a bar code equivalent to the twelve individual digits so enabling the printer 20 to print a bar code corresponding to any selected twelve digits. In the "read only" memory 21, which is preferably constituted by a readily

replaceable integrated circuit chip, are held the following:—

look-up tables of basic franking values appropriate to different categories of mail weighting values for use as multipliers appropriate to each one of the possible nine digits in the first digit space. That is to say, a different multiplier would be used to multiply the basic franking value according to the nature of the article to be delivered. Also in the ROM 21 is held a series of multiplier values appropriate to each of the digits which may be placed in the second digit space; that is to say a different multiplier value will be used in calculating the franking value for each one of the possible different classes of mail. For example, a multiplier of unity might be used for ordinary mail, a multiplier of 0.75 for second class mail, and a multiplier of 5.0 for air mail.

The replaceability of the ROM 21 is an important and advantageous feature of the invention, since it means that the Post Office or the delivery service can readily issue new integrated circuit chip ROMs 21 to the holders of hand-held domestic franking machines, at any time when they wish to change the postal rates, for example due to inflation of costs.

The ROM will also hold a "look up" table of multipliers appropriate to each possible two digit numeral derived from the comparison of the two digit major sorting area code of the machine concerned and the two digit major sorting area code of the intended destination for the article, and for dealing similarly with the other comparisons described above. These multipliers are used by the microprocessor 16 to multiply the base franking value in the process of calculation of the franking value appropriate to the delivery of the particular article in question.

In a preferred embodiment of the invention, the display 42 on the franking machine is caused to flash when the accounting unit 12 has signalled that the relevant sum has been debited from the user's account, whereupon the user will press the print button 45 so causing the printer 20 to operate. The keyboard may include a call up button 47 which causes the machine 10 to give a visual display in the window 42 of the actual monetary amount charged to the user in the account unit 12. After the printing of the bar code, a lock out signal is generated which causes the electronic lock 17 to be closed and it remains closed until a subsequent "account debited" signal from the accounting unit 12 is fed back to the hand-held franking machine 10. In this way, security is assured.

Once the display 42 signals that the franking value has been debited to the user's account in the accounting unit 12, the user applies the printing face 55 of the machine to the relevant portion of the envelope and operates the print button 45. The machine then prints a bar code on the envelope which gives information regarding the destination, in accordance with the destination code which the user has fed in. As stated, the memory 18 also includes the information

necessary to translate any decimal numeral into its bar code representation, thereby making the machine usable for addressing packages, articles or envelopes to any part of the territory covered by the postal authority for the delivery service).

As an optional refinement, further information may be retained in the memory whereby countries outside the United Kingdom are given a code and, when said code is punched in the keyboard, e.g. as the third digit of the twelve, the franking value debited is adjusted by a suitable multiplier to an amount corresponding to the postage rate to the destination country.

Figure 3 illustrates an envelope bearing a handwritten address and a bar code franking applied by a machine according to the present invention. As illustrated, the bar code indicia 60 are applied to a self adhesive patch 62, and this is stuck on the envelope 64. In an alternative embodiment of the invention, the bar code indicia could be applied directly to the surface of the envelope. It will be seen that the digits represented by the bar code are indicated along the bottom edge of the code strips.

The number identifying the particular machine 10 and the franking value as calculated by the microprocessor 16 are fed along the cable 26 and the line 32 to the accounting unit 12. Figure 4 illustrates in block diagram form one suitable accounting unit. Such a unit includes an identity check section 70 which checks that the machine 10 is one of those for which an account is held, and, if satisfied on this point, triggers operation of a selector 72 which passes the incoming signal through to the account descending register 74 particular to the machine 10 concerned. As mentioned above, this descending register is preferably the register which holds the telephone account of the user. Upon receipt of the franking value signal the register 74 is debited by the amount which it represents, and once this is done, a "debit done" circuit 76 issues a release signal which is passed along the line 78 and back along the line 32 and cable 26 to the electronic lock 17, so releasing the lock 17 and opening the gate 23. Hence the printer may then be actuated and the user presses the print button 45 and places the machine 10 on the envelope 64 as indicated in Figure 2, while the printer prints the bar code 60.

Figure 5 illustrates one possible arrangement of a sorting machine, for handling mail marked in accordance with the system disclosed in the present application. Bar coded mail 80 is laid face downwards on a conveyor 82, and the bar code thereon is read by a laser scanner 84 whose electrical output is sent to a microprocessor 86. The sorting machine also includes an array of sensors, indicated at 83, which are arranged to sense the volume or weight or maximum dimensions of the article. The value so obtained is fed to the microprocessor 86 and is compared therein with like information appertaining to the particular category of mail and class of mail as identified by the first two digits of the twelve digit bar code borne by the article under scrutiny. This

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comparison is applied to determine whether the article has been franked with the correct first and second digits. In other words, the sensors 83 and the microprocessor 86 check whether the correct
 5 franking value has been applied to the article. If not, the article is diverted to a separate storage location, not shown, by a diverter actuated by a signal from the microprocessor 86. If it has, the microprocessor 86, via an output line 88, instructs
 10 a gate controller 90 of a collator machine 92 having an appropriate number of outlets. The gate controller 90 positions certain diverting gates in the collator machine in accordance with the signal supplied from the microprocessor 86, so that all
 15 items of mail sharing a given part of the destination code are directed into a single temporary storage location. It will be appreciated that each group of items so separated may be similarly treated to further divide them at a sub-regional level, then at a district level and at a local level.

It will be seen that the franking machine disclosed herein, and the system of using same in conjunction with a remotely-located accounting unit and a sorting machine designed to read bar codes, enables particularly efficient and automated delivery of packages, as well as a direct accounting entry in respect of the cost of such delivery. Among other advantages are that the problems of optical character recognition of different persons' handwriting are avoided, and a virtually immediate and automatic electronic accounting is kept of the amount of franking value dispensed by the hand-held machine of any
 20 particular user.

CLAIMS

1. A system of applying a bar code to a package or the like to be delivered, the bar code embodying franking value information as well as destination
 40 information, and, in the same operation, debiting a relevant account at a remote location with a monetary amount corresponding to the franking value.

2. A portable franking machine including a
 45 keyboard of push buttons or the equivalent whereby numerical data can be fed into the machine; electronic circuitry connected to the keyboard, the circuitry being associated with a memory having a first storage portion containing an address code unique to the machine, a second storage portion containing information necessary to enable a bar code equivalent of a series of
 50 numerical digits, to be printed, and a third storage portion containing postal rate and postal class data to enable the calculation by the microprocessor of postal charges from an address code assigned to the intended destination and the unique address code of the machine; and a printer

whereby a series of visible indicia indicative of
 60 particular combination of numerical characters can be printed in the form of a bar code on an envelope, package, parcel or like article, the particular combination being selected by the user by operation of the keyboard.

3. A machine according to claim 2 in which the visible indicia are the elements of a bar code.

4. A machine according to claim 2 or 3 which is attached to an electrical cable which can be plugged in or otherwise attached to a telephone line, and having a section of its circuitry connected
 70 via the cable and the line to a central accounting unit, the said section being arranged to transmit, in use, an electrical signal embodying numerical information to the central accounting unit

75 remotely located at the end of the telephone line.

5. A sorting machine for sorting articles such as letters and small packets bearing visible indicia in the form of a bar code thereon, the machine including as essential elements a sensing head for
 80 reading the bar code, a plurality of gates for diverting articles from one flow path into another, and a microprocessor for actuating the gates in accordance with signals from the sensing head resulting from the particular indicia on the article.

6. An accounting unit connectable to a telephone line and constructed and arranged to receive a signal embodying numerical information representative of the identity of the transmitting franking machine and of a monetary franking value, and to utilise the latter part of the signal to
 90 debit an accounting descending register with an amount corresponding to the said monetary value.

7. A machine according to claim 2, 3, or 4 in which the printer in the franking machine is an ink
 95 jet printer.

8. A system for the franking and despatching of articles such as letters or packages, the system comprising a franking machine for applying to the article visible indicia containing information
 100 relating to (a) the franking value applied, (b) the intended destination; an accounting unit located remotely from the franking machine and having a register which contains a record of a monetary balance amount, the accounting unit being
 105 connected to, or connectable to, the franking machine by an electric cable; and a sorting machine for handling articles bearing said visible indicia, for scanning same, and for redirecting them into flow paths chosen in accordance with
 110 the intended destination information.

9. A franking machine substantially as herein described with reference to and as illustrated in the accompanying drawings.

10. A system for franking, despatching, and
 115 sorting articles substantially as herein described with reference to and as illustrated in the accompanying drawings.

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